

## Message Text

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PAGE 01 BONN 19361 01 OF 02 161424Z

53

ACTION OES-06

INFO OCT-01 EUR-12 ISO-00 SS-15 ACDA-07 PM-04 H-02 DODE-00

EB-07 NRC-05 NSAE-00 USIA-06 TRSE-00 ERDA-05 CIAE-00

COME-00 INR-07 IO-13 L-03 NSC-05 FEAE-00 /098 W

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R 161406Z NOV 76

FM AMEMBASSY BONN

TO SECSTATE WASHDC 3315

INFO USMISSION EC BRUSSELS

LIMITED OFFICIAL USE SECTION 01 OF 02 BONN 19361

E.O. 11652: N/A

TAGS: PARM, TECH, GW

SUBJ: USE OF HIGHLY ENRICHED URANIUM (HEU) FOR  
RESEARCH APPLICATIONS

REF: (A) STATE 271079; (B) BONN 18337

1. SUMMARY: AS REQUESTED IN REF A, DR. MCCLELLAND,  
EMBASSY'S COUNSELOR FOR SCIENTIFIC & TECHNOLOGICAL  
AFFAIRS, MET WITH APPROPRIATE GOVERNMENTAL AUTHORITIES  
AND WITH END USERS INCLUDING SCIENTISTS AND PROGRAM  
MANAGERS TO VERIFY THAT EXPORT OF HEU TO FRG FOR FOUR  
ORDERS LISTED IS TECHNICALLY AND ECONOMICALLY  
JUSTIFIED. JUSTIFICATION FOR FIRST ORDER LISTED REF A  
WAS FORWARDED IN REF B. REMAINING 3 CASES ARE ALSO  
TECHNICALLY AND ECONOMICALLY JUSTIFIED, AS DESCRIBED  
BELOW. END SUMMARY.

2. INTRODUCTION: SECOND, THIRD AND FOURTH EXPORT  
ORDERS LISTED IN PARA 2, REF A TOTAL 125.113 KILOGRAMS  
OF HEU WITH ENRICHMENTS RANGING FROM 93.15  
TO 93.3 PERCENT. ALL OF THIS MATERIAL IS REQUIRED FOR THE  
FABRICATION OF FUEL ELEMENTS FOR THE FOLLOWING FOUR  
NUCLEAR RESEARCH AND/OR DEMONSTRATION REACTORS: FRM,  
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PAGE 02 BONN 19361 01 OF 02 161424Z

KNK-II, AVR AND THE THTR-300. TECHNICAL AND ECONOMIC

JUSTIFICATIONS FOR USE OF HEU IN AVR AND THTR-300 ARE SIMILAR. THESE TWO REACTORS WILL BE DISCUSSED TOGETHER.

3. EXPORT OF 4.653 KILOGRAMS OF 93.15-PERCENT U-235 FOR THE FRM GARCHING RESEARCH REACTOR (AND THAT PORTION OF THE 17.16 KILOGRAM HEU EXPORT DESTINED FOR THE FRM REACTOR):

A. FRM (A RESEARCH REACTOR AT THE TECHNICAL UNIVERSITY OF MUNICH) WAS THE FIRST NUCLEAR REACTOR IN GERMANY (OCTOBER 1957). IT IS A 4 MW, POOL-TYPE RESEARCH REACTOR WHICH USES MTR-TYPE FUEL ELEMENTS CONTAINING HEU. CENTRAL THERMAL NEUTRON FLUX DENSITY APPROXIMATELY 4 TIMES 10 TO 13. RESEARCH PROGRAM INCLUDES BOTH BEAM AND IRRADIATION EXPERIMENTS USING 11 BEAM TUBES AND 2 RABBIT SYSTEMS.

B. THE USE OF HEU IN THE FRM IS TECHNICALLY JUSTIFIED BY THE NEED TO ACHIEVE A NEUTRON FLUX DENSITY ADEQUATE FOR THE BEAM AND IRRADIATION EXPERIMENTAL PROGRAM CURRENTLY IN PROGRESS. URANIUM ENRICHED TO TWENTY PERCENT U-235 OR LESS COULD NOT BE USED.

4. EXPORT OF 103.3 KILOGRAMS OF 93.3 PERCENT U-235 FOR THE THTR-300 THORIUM HIGH TEMPERATURE REACTOR (AND THAT PORTION OF THE 17.16 KILOGRAM HEU EXPORT ORDER DESTINED FOR THE AVR REACTOR):

A. THE CURRENT GERMAN HIGH-TEMPERATURE, GAS-COOLED REACTOR (HTR) DEVELOPMENT PROGRAM INCLUDES OPERATION OF THE AVR AND CONSTRUCTION OF THE THTR-300. THE AVR (ARBEITS GEMEINSCHAFT VERSUCHSREAKTOR), A 15 MWE PROTOTYPE NUCLEAR POWER PLANT, IS FUELED WITH SPHERICAL GRAPHITE FUEL ELEMENTS, FIVE CENTIMETERS IN DIAMETER; THE "PEBBLE-BED" CONCEPT. THIS URANIUM FUEL IS HIGHLY ENRICHED IN U-235, CONTAINED IN A 1-10

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PAGE 03 BONN 19361 01 OF 02 161424Z

MIXTURE OF URANIUM AND THORIUM OXIDES. THE AVR HAS BEEN OPERATING SATISFACTORILY SINCE 1967. THE SECOND STEP IN THE GERMAN HTR DEVELOPMENT PROGRAM IS THE THTR-300 (300 MWE), A LARGER SCALE DEMONSTRATION PLANT OF SIMILAR DESIGN ALSO USING SPHERICAL FUEL ELEMENTS. THE PROGRAM HAS SEVERAL OBJECTIVES, INCLUDING EXPERIMENTS RELEVANT TO HIGH-TEMPERATURE

NUCLEAR PROCESS HEAT AND THE DEMONSTRATION OF  
THE THORIUM CYCLE (U-235 TO U-233 VIA TH-232)  
IN THE EXPECTATION THAT A VERY HIGH CONVERSION  
RATIO CAN BE ACHIEVED WITH SIGNIFICANT

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PAGE 01 BONN 19361 02 OF 02 161424Z

53

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ECONOMIC BENEFITS INCLUDING CONSERVATION OF  
URANIUM RESOURCES.

B. HEU IS TECHNICALLY AND ECONOMICALLY  
ESSENTIAL IN THE AVR/THTR-300 DEVELOPMENT  
PROGRAM. WITHOUT HEU, AN ESSENTIAL ELEMENT  
OF THE FRG'S HTR PROGRAM -- THE DEMONSTRATION  
OF THE THORIUM CYCLE -- BECOMES IMPOSSIBLE.

5. THAT PART OF THE 17.16 KILOGRAM HEU EXPORT ORDER  
DESTINED FOR THE KNK-II REACTOR:

A. KNK-II ("COMPACT SODIUM COOLED REACTOR")  
WILL BE GERMANY'S FIRST OPERATING LIQUID-  
METAL-COOLED, FAST-NEUTRON-SPECTRUM NUCLEAR  
POWER STATION WHEN RECONSTRUCTION OF KNK-1  
(A THERMAL NEUTRON SPECTRUM, SODIUM COOLED  
REACTOR) IS COMPLETED IN 1977. IT WILL  
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PAGE 02 BONN 19361 02 OF 02 161424Z

EMPLOY A TWO-ZONE CORE: ONE ZONE CONTAINS  
MIXED OXIDES OF PLUTONIUM AND HIGHLY-ENRICHED  
URANIUM, THE SECOND ZONE ONLY HEU OXIDE FUEL  
ELEMENTS. THE KNK-II NUCLEAR POWER STATION  
WILL GENERATE ABOUT 20 MWE. THE FACILITY IS  
DESIGNED TO PRODUCE ESSENTIAL DATA FOR THE  
FRG LMFBR PROGRAM, INCLUDING THE CONSTRUCTION  
AND OPERATION OF THE SNR-300, A 300 MWE  
DEMONSTRATION NUCLEAR POWER PLANT.

B. REACTIVITY CONSIDERATIONS REQUIRE THE USE  
OF HEU IN THE KNK-II AND OTHER FAST REACTORS.  
THIS REACTOR, AS PRESENTLY DESIGNED, WOULD NOT  
OPERATE WITH URANIUM OF 20 PERCENT OR LESS  
U-235.

6. EMBASSY COMMENT: FRG OFFICIALS RESPONSIBLE FOR  
THE NUCLEAR FUEL CYCLE REQUESTED--AND WERE GIVEN--  
ASSURANCES THAT USG WOULD DISCUSS REF A REQUEST WITH  
REPRESENTATIVES OF EURATOM SUPPLY AGENCY. STOESSEL

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## Message Attributes

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**Capture Date:** 01 JAN 1994  
**Channel Indicators:** n/a  
**Current Classification:** UNCLASSIFIED  
**Concepts:** URANIUM, POLICIES, EXPORT CONTROLS, NUCLEAR RESEARCH, RADIOACTIVE ISOTOPES  
**Control Number:** n/a  
**Copy:** SINGLE  
**Draft Date:** 16 NOV 1976  
**Decaption Date:** 01 JAN 1960  
**Decaption Note:**  
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**Disposition Approved on Date:**  
**Disposition Authority:** ElyME  
**Disposition Case Number:** n/a  
**Disposition Comment:** 25 YEAR REVIEW  
**Disposition Date:** 28 MAY 2004  
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**Original Handling Restrictions:** n/a  
**Original Previous Classification:** n/a  
**Original Previous Handling Restrictions:** n/a  
**Page Count:** 4  
**Previous Channel Indicators:** n/a  
**Previous Classification:** LIMITED OFFICIAL USE  
**Previous Handling Restrictions:** n/a  
**Reference:** 76 STATE 271079, 76 BONN 18337  
**Review Action:** RELEASED, APPROVED  
**Review Authority:** ElyME  
**Review Comment:** n/a  
**Review Content Flags:**  
**Review Date:** 29 APR 2004  
**Review Event:**  
**Review Exemptions:** n/a  
**Review History:** RELEASED <29 APR 2004 by ellisoob>; APPROVED <28 JUL 2004 by ElyME>  
**Review Markings:**

Margaret P. Grafeld  
Declassified/Released  
US Department of State  
EO Systematic Review  
04 MAY 2006

**Review Media Identifier:**  
**Review Referrals:** n/a  
**Review Release Date:** n/a  
**Review Release Event:** n/a  
**Review Transfer Date:**  
**Review Withdrawn Fields:** n/a  
**Secure:** OPEN  
**Status:** NATIVE  
**Subject:** USE OF HIGHLY ENRICHED URANIUM (HEU) FOR RESEARCH APPLICATIONS  
**TAGS:** PARM, TECH, GE  
**To:** STATE  
**Type:** TE  
**Markings:** Margaret P. Grafeld Declassified/Released US Department of State EO Systematic Review 04 MAY 2006